BEFORE

THE PUBLIC SERVICE COMMISSION

OF SOUTH CAROLINA

DOCKET NO. 2019-224-E
DOCKET NO. 2019-225-E

In the Matter of	)
	)
South Carolina Energy Freedom Act	)
(House Bill 3659) Proceeding Related to	)
S.C. Code Ann. Section 58-37-40 and	)
Integrated Resource Plans for Duke Energy	)
Carolinas, LLC and Duke Energy Progress,	)
LLC	)
	)
	)

SURREBUTTAL TESTIMONY OF

TYLER FITCH

ON BEHALF OF

VOTE SOLAR

APRIL 15, 2021

Introduction and Summary

Q. Please state your name, title, and employer.

A. My name is Tyler Fitch. I am Regulatory Director for the Carolinas at Vote Solar.

Q. Are you the same Tyler Fitch that submitted prefiled direct testimony in this proceeding?

A. Yes. I submitted direct testimony on behalf of Vote Solar on February 5, 2021.

Q. What is the purpose of your surrebuttal testimony?

A. The purpose of this testimony is to provide a response to the rebuttal testimony of Duke Energy Carolinas, LLC and Duke Energy Progress, LLC ("DEC" and "DEP," respectively, and collectively referred to as "The Companies") Witnesses Dewey S. Roberts, Dawn Santoianni, Glen Snider, and Mark Oliver in this proceeding.

Q. Have you reviewed the rebuttal testimonies of the witnesses you have referenced here?

A. I have.

Q. Please provide a recap of your direct testimony in this proceeding.

A. The direct testimony I filed in this proceeding introduces climate-related risks as an emergent, relevant, and material category of business risks for the Companies and their ratepayers. My testimony begins by identifying the role that climate-related risk and risk management play for resource planning in general and the Companies' 2020 Integrated Resource Plans ("Plans") in particular. The testimony then evaluates the Companies' assessment and management of climate-related risks within its Plans. I conclude that the Companies did not adequately identify or manage climate-related risks, and as such the Plans are not the most reasonable and

prudent means for meeting the energy needs of the Companies' ratepayers. I provide several recommendations to the Commission on how the Companies could better integrate these risks in future integrated resource plans.

To better characterize the magnitude of climate-related risks to new gas-fired generation units proposed by the Companies in their Base Case with Carbon Policy scenario, I include a report I authored, titled "Carbon Stranding: Climate Risk and Stranded Assets in Duke's Integrated Resources Plan," as an exhibit to my direct testimony (I will refer to this report as the "Carbon Stranding Report" and the analysis done within the report as "Carbon Stranding Analysis" in this testimony). The Carbon Stranding Report uses a high-level economic model to evaluate stranded asset cost risks that ratepayers could be exposed to in future years as the Companies continue to expand gas-fired generation capacity in the context of accelerating climate-related risks. The Carbon Stranding Analysis is not, nor was it intended to be, an alternative resource plan. Instead, it provides the Commission an indicator of the magnitude of climate-related economic risks to ratepayers posed by substantial investment in new gas-fired generation assets.

Q. Please describe the structure of your surrebuttal testimony.

A. This testimony is broken up into several sections, corresponding roughly with the discussion and complaints raised by the Companies Witnesses in their rebuttal testimony.

Companies Witnesses Roberts, Santoianni, and Snider raise several technical complaints with the Carbon Stranding Analysis, which I respond to in the initial section of my surrebuttal testimony. Company Witnesses' complaints provide a

helpful forum for clarifying several misunderstandings about the nature of the Carbon Stranding Analysis.

After the initial section, I respond to complaints or issues raised by the rebuttal testimonies of Witness Roberts, Santoianni, Snider, and Oliver in separate sections.

A. Responses to Technical Complaints with Carbon Stranding Analysis

Q. Have you reviewed the Companies' Witnesses rebuttal testimony concerning the technical aspects of your Carbon Stranding Report?

A. I have.

Q. Will you summarize the purpose of the Carbon Stranding Analysis presented as a part of your direct testimony?

A. Yes. The carbon stranding analysis provides an illustrative, clear, and transparent projection of potential carbon stranding costs that ratepayers could pay as a result of the long-term climate-related risks of new gas-fired generation units. The conclusions of my direct testimony, including the materiality of climate risks to the Companies and the inadequate assessment and management of those risks by the Companies, do not rely solely on the Carbon Stranding Analysis. Instead, the analysis quantifies one of several dimension of climate-related risks to ratepayers as a result of the Companies' proposed Base Case with Climate Policy scenario.

Q. Please provide an overview of technical complaints of Company Witnesses Roberts, Santoianni, and Snider with the Carbon Stranding report.

A. Companies Witnesses Roberts, Santoianni, and Snider identify several technical complaints with the Carbon Stranding Analysis. These are focused on the specific methodology of the Carbon Stranding Analysis and, because of the similarity of

complaints across the Company Witnesses, will be addressed together in this section.

Companies Witnesses lodge technical complaints in their testimony about the methodology used in the carbon stranding analysis, but they do not rebut the basic finding that carbon-emitting assets will be subject to increased risks and potentially stranding through mid-century. The Witnesses generally agree that these assets will be subject to increased climate-related transition risks over time, and that their role in the Companies' fleet will dramatically change over the coming decades.[1] The analysis put forward by the Carbon Stranding analysis assesses long-term risks for the Companies' new-build gas-fired assets in that context. Companies Witnesses' technical complaints with the analysis do not dispute *what* the analysis is calculating, only *how* it is being calculated.

Q. Companies Witnesses take issue with the use of an annual economic model for this analysis.[2] Please provide your response.

A. Part of the process of modeling is choosing an analytical model that is most appropriate for the question at hand, and no model is perfectly suited for all research questions. There is a constant trade-off present in model selection between granularity, transparency, inputs required, labor intensity, and clear outcomes. While production cost modeling, for example, integrates an hourly scale of analysis, its analytical complexity makes it ill-suited for analyses with long time

[1] *See:* Rebuttal Testimony of Duke Energy Carolinas, LLC and Duke Energy Progress, LLC Witness Dewey S. Roberts II ("Roberts Rebuttal"), p. 39, ll. 8-10; Rebuttal Testimony of Duke Energy Carolinas, LLC and Duke Energy Progress, LLC Witness Dawn A. Santoianni ("Santoianni Rebuttal"), p. 5, l. 21 to p. 6, l. 1; Rebuttal Testimony of Duke Energy Carolinas, LLC and Duke Energy Progress, LLC Witness Glen A. Snider ("Snider Rebuttal"), p. 114, ll. 10-12.

[2] *See*: Santoianni Rebuttal, p. 13, l. 19 to p. 14, l. 10; Snider Rebuttal, p. 107, ll. 11-16.

horizons. This conclusion is roughly consistent with the Companies' decision not to extend production cost modeling through 2050 in development of their Plans.[3] The research question posed by the Carbon Stranding report is a relatively straightforward economic question, with a long relevant time horizon: How much in stranding costs could ratepayers be exposed to as a result of climate-related risks incident on carbon-emitting generation? Based on the specific analytical needs of this research question, the carbon stranding analysis uses a straightforward, annual economic model of the Companies' system over the lifetime of current and proposed gas-fired generation. As a helpful reference, the analytical method used here is consistent with energy transition analysis conducted by the Oxford University Sustainable Finance Programme and Georgia Institute of Technology.[4] Modeling choices aside, potential stranding costs for ratepayers that unfold 2036-2050 are relevant for planning procedures today. Declining to conduct an analysis of this type would leave decisionmakers without critical information to make an informed decision on committed future costs.

Q. Companies Witnesses take issue with the carbon stranding analysis model's use of a historical baseline for capacity factor and emissions intensity.[5] Please provide your response.

A. Clarity and transparency are top priorities for the carbon stranding model. By using an average historical baseline for capacity factor and emissions intensity, the

[3] Direct Testimony of Vote Solar Witness Tyler Fitch ("Fitch Direct"), p. 85, ll. 3-11.
[4] Fitch, T. (2021, January). Carbon Stranding: Climate Risk and Stranded Assets in Duke Energy's Integrated Resources Plan ("Carbon Stranding Report"). *Energy Transitions Institute*. p. 40. Attached to Fitch Direct Testimony as Exhibit TF-2.
[5] *See:* Roberts Rebuttal, p. 39, ll. 6-16; Santoianni Rebuttal, p. 15, l. 7 to p. 16, l. 7; Snider Rebuttal, p. 107, l. 18 to p. 108, l. 7.

analysis relies on an empirical historical foundation instead of a speculative trajectory for capacity factor and emissions intensity. As discussed in the response to the previous complaint, any modeling exercise entails tradeoffs between granularity and transparency; in this case, the carbon stranding analysis emphasizes transparency.

Q. Companies Witnesses take issue with the use of a carbon constraint in this analysis.[6] Please provide your response.

A. The carbon constraint in the analysis functions as a proxy for incidence of a broad set of climate-related risks. The purpose of the carbon constraint is not to emulate the impact of any specific regulatory policy; rather, it is a single indicator for vulnerability to an accelerating set of climate-related risks, including not only potential costs from carbon regulation but also the economic risk of stranding through more affordable, zero-carbon options; the risk of financial actors designating the Companies' fleet as unduly risky; or even the reputational risk of a perceived discrepancy between the Companies' commitments on climate change and their short-term actions. This analysis does not attempt to predict precisely when these costs will accrue to the Companies' ratepayers or shareholders, but the consistent slope of the carbon constraint approximates increasing exposure, year over year, to accelerating risks.

The use of a gradual approach is designed to avoid unexpected costs of a disorderly or disruptive transition, which is likely to lead to increased costs and stranded

[6] *See:* Roberts Rebuttal, p. 39, ll. 17-20; Santoianni Rebuttal, p. 16, l. 8 to p. 17, l. 6; Snider Rebuttal, p. 108, l. 8 to p. 109, l. 13.

assets. The Network for Greening the Financial System, a consortium of national banks that encompasses the top economies in the world, calls potential sudden transitions to a decarbonized economy "disorderly" or "disruptive" transitions, marked by increased costs for everyone and, according to one estimate, over $20 trillion in stranded assets across the world.[7] The linear carbon constraint assumes that Companies will take an 'orderly,' gradual approach to its transition.

Witness Santoianni's claim that the analysis prevents "lumpy" emissions trajectories is incorrect. The projected emissions pathway before the constraint is applied shows the "lumpy" reductions in carbon emissions that Witness Santoianni is referring to.[8] The reason no "lumpy" emissions exist in the carbon-constrained case is because the status-quo emissions remain consistently above the carbon constraint's pathway to zero by 2050. If the Companies' Plans pursued more ambitious reductions in emissions, the carbon stranding analysis would show "lumpy" reductions even with the constraint applied.

Q. Companies Witness Santoianni takes issue with the carbon stranding analysis resolving to zero gross emissions in 2050.[9] Please provide your response.

A. There are two principal methods by which a carbon-emitting energy system could reduce emissions to zero: Negative emissions "carbon capture" technologies and carbon offsets. I address the emergent issues with either of these methods in my direct testimony, and will reiterate the main points here. There are permanence,

[7] Network for Greening the Financial System (2019, April). "A call for action: Climate change as a source of financial risk." Retrieved at: https://www.banque-france.fr/sites/default/files/media/2019/04/17/ngfs_first_comprehensive_report_-_17042019_0.pdf.
[8] Fitch Direct, p. 68.
[9] Santoianni Rebuttal, p. 16 l. 22 to p. 17, l. 1.

leakage, and 'crowding out' effects that challenge the continued viability of carbon offsets.[10] Regarding carbon capture and storage, the Companies stated in discovery "[carbon capture and storage] is not applicable in the Carolinas,"[11] and that they "[do] not expect to apply low carbon retrofits for hydrogen fuel, renewable gas, or carbon capture and storage."[12]

Q. Companies Witnesses believe your testimony relies on levelized-cost-of-electricity ("LCOE") studies to demonstrate economic substitution between gas and renewables.[13] Please respond.

A. Witnesses Snider and Santoianni's rebuttal testimonies cite one levelized-cost-of-energy analysis, but do not consider four other analyses and one resource planning example also provided in the *economic risks* section of the Carbon Stranding report. These other studies show that it can be both feasible and cost-effective to replace gas generation with a combination of renewables and storage when accounting for the hourly generation profile of gas-fired units. I will summarize these studies briefly below:

- **RMI: The Growing Market for Clean Energy Portfolios.** A combination of clean energy technologies could provide hour-for-hour replacement of a new gas unit at competitive prices today. Continued cost declines mean these technologies could outcompete existing gas generation as early as 2030.[14]
- **Bloomberg New Energy Finance: How PV-Plus-Storage Will Compete with Gas Generation in the US.** Because of the low capacity factor of most

[10] Fitch Direct, p, 70, ll. 10-16.
[11] Fitch Direct, p. 80, ll. 1-2.
[12] Fitch Direct, p. 80, ll. 14-16.
[13] *See:* Santoianni Rebuttal, p. 18, ll. 11-17; Snider Rebuttal, p. 110, l. 13 to p. 111, l. 7.
[14] Teplin, C., Dyson, M., Engel, A., Glazer, G. (2019). The Growing Market for Clean Energy Portfolios. *RMI.* Retrieved at: https://rmi.org/insight/clean-energy-portfolios-pipelines-and-plants/.

combustion turbines "peaker" plants, PV-plus-storage technologies are already competitive against many new-build peakers in the United States.[15]

- **EnergyInnovation and Vibrant Clean Energy: Economic and Clean Energy Benefits of Establishing a Southeast U.S. Competitive Wholesale Electricity Market.** A regional transmission organization in the Southeast would unlock substantial new investment in renewable energy technologies while retiring coal and avoiding a gas buildout, while saving money for ratepayers.[16]
- **UC-Berkeley: The 2035 Report.** Given current renewable energy and energy storage costs and trajectories, the United States could achieve 90 percent clean energy by 2035 without an increase in costs to ratepayers.[17]

Additionally, analysis shows the economic risk to gas generation even in the context of the Plans under consideration in this proceeding. Since the Carbon Stranding report was published, energy consultants Synapse Energy Economics performed an independent analysis of the Companies' 2020 Integrated Resource Plans using EnCompass. After adjusting several inputs from the Companies' approach, Synapse's modeling found that the Companies could achieve a resource plan that avoids building new gas generation and substantially reduces emissions (thus reducing climate-related risks) while providing lower costs to ratepayers.[18]

---

[15] BloombergNEF (2020, November). How PV-Plus-Storage Will Compete With Gas Generation in the U.S. Retrieved at: https://about.bnef.com/blog/how-pv-plus-storage-will-compete-with-gas-generation-in-the-u-s/.

[16] Gimon, E., O'Boyle, M., McNair, T., Clack, C., Choukulkar, A., Cote, B., McKee, S. (2020, August). Economic and Clean Energy Benefits of Establishing a Southeast U.S. Competitive Wholesale Electricity Market. *EnergyInnovation and Vibrant Clean Energy.* Retrieved at: https://energyinnovation.org/wp-content/uploads/2020/08/Economic-And-Clean-Energy-Benefits-Of-Establishing-A-Southeast-U.S.-Competitive-Wholesale-Electricity-Market_FINAL.pdf.

[17] Phadke, A., Paliwa, U., Abhyankar, N., McNair, T., Paulos, B., Wooley, D., O'Connell, R., (2020, June). 2035 Report: Plummeting Solar, Wind, and Battery Costs Can Accelerate our Clean Electricity Future. Retrieved at: http://www.2035report.com/wp-content/uploads/2020/06/2035-Report.pdf?utm_referrer=https%3A%2F%2Fwww.2035report.com%2F.

[18] Wilson, R., Addleton, I., Takahashi, K., & Litynski, J. (2021, March). Clean Affordable and Reliable: A Plan for Duke Energy's Future in the Carolinas. *Synapse Energy Economics.* Retrieved at: https://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=c7634c1a-f709-4d7c-b281-b8fcf97166e7.

Q. Companies Witnesses take issue with the Carbon Stranding Analysis's use of 40-year book lives for new gas generation.[19] Please provide your response.

A. The Carbon Stranding Analysis' use of a 40-year book life is supported both by industry reference and the Companies' existing practices regarding retiring existing gas plants. The Carbon Stranding Analysis uses input data from the US Energy Information Administration's 2020 Annual Energy Outlook for capital costs and operating lifetimes of projected new-build gas generation plants.[20] The operating lifetime assumed for new-build gas plants in the Annual Energy Outlook is 40 years. This is consistent with the Companies' treatment of its existing gas generation fleet, where planned operating lifetimes range between 36 and 55 years.[21] Given these two sources, using a book life of 40 years for new-build plants within the Companies' plans is reasonable.

Q. Please provide your conclusions after reviewing the Companies Witnesses technical complaints.

A. The Carbon Stranding Analysis was conducted to address a discrepancy at the center of the Companies' Plans: The Companies seeks to build a new fleet of gas-fired, carbon-emitting generation in the face of accelerating climate-related risks, as acknowledged by Duke Energy through its commitment to a net-zero carbon energy system by 2050. As discussed in my direct testimony, the Plans do not

[19] *See:* Santoianni Rebuttal, p. 17, ll. 6-10; Snider Rebuttal, p. 110, ll. 2-3.
[20] US Energy Information Administration (2020, February). Capital Cost and Performance Characteristic Estimates for Utility Scale Electric Power Generating Technologies. Retrieved at: https://www.eia.gov/analysis/studies/powerplants/capitalcost/pdf/capital_cost_AEO2020.pdf.
[21] Duke Energy Carolinas Integrated Resources Plan 2020 Biennial Report ("DEC IRP Main Document"), pp. 204-207 (not including the Lee gas-fired boiler unit) *and* Duke Energy Progress Integrated Resources Plan Biennial Report ("DEP IRP Main Document"), pp. 203-206.

reconcile the emissions from these plants with climate risks and corporate long-term commitments. The Carbon Stranding Analysis provides a high-level quantification of risks to ratepayers arising from this discrepancy.

The Companies Witnesses' technical complaints with the carbon stranding analysis do not rebut, or attempt to rebut, this discrepancy. While Companies Witnesses have lodged several technical complaints with the carbon stranding analysis, the Companies have not produced their own estimation of retrofit costs or stranding risks to their carbon-emitting fleet through mid-century and beyond. Understanding the nature of these risks is critical for assessing the prudence of the Companies' Plans, and the carbon stranding analysis provides valuable information to the Commission for the purposes of assessing long-term risks.

B. Response to Witness Roberts

Q. Have you reviewed the rebuttal testimony of Companies Witness Roberts?

A. I have.

Q. Please provide an overview of Witness Roberts' testimony.

A. Witness Roberts raises two technical complaints with the analysis conducted in the Carbon Stranding Report, which I have addressed in the previous section. Generally speaking, Witness Roberts' rebuttal testimony concerns how the Companies will assure system reliability during the clean energy transition, and the role of new gas generation in that transition.

Q. Witness Roberts claims that your testimony ignores the Companies' mandate to provide reliable energy.[22] Please provide your response.

A. Companies Witnesses misunderstand my testimony in this regard. My testimony does not advocate that the Companies depart from existing reliability standards. To the contrary, it assumes, as Witness Roberts quotes, that the Companies will continue to manage reliability risks in keeping with prudent utility operations.[23] The focus of my testimony, rather, is on potential risks to both reliability and affordability that might arise if the Companies do not adequately integrate climate-related risks. Integrating climate-related risks is complementary to, rather than exclusive with, assuring system reliability. The scenarios within the Companies' Plans show that there are multiple pathways to achieving system reliability;[24] by integrating climate-related risks, the Companies can achieve a Plan that provides reliable, affordable, sustainable power while avoiding climate-related impacts to reliability and affordability.

Q. Do you agree with Witness Roberts on any points made in his testimony?

A. Yes. While I agree that looking to examples in other regions can be helpful for understanding the drivers of reliability events across the electricity grid, though I do not agree with the Companies Witnesses' conclusions and would note that any reliability event is likely to have location-and time-specific circumstances, In his rebuttal testimony, Witness Roberts identifies two reliability events. One is the

[22] Roberts Rebuttal, p. 3, ll. 16-20.
[23] Roberts Rebuttal, p. 37, ll. 14-15.
[24] DEP IRP Main Report, p. 6.

recent cold snap and ensuing blackouts on the ERCOT grid in February 2021. The second is the August 2020 CAISO summer heat reliability event.[25]

Q. Are there lessons for integrating climate-related risks into resource planning from these reliability events?

A. Yes. Blackouts in both cases were driven by extreme weather events that the systems had not planned for—extreme weather events that are likely to become more frequent due to climate change. The root cause analysis conducted by the California ISO after the August 2020 heat wave identified the "climate change-induced extreme heat wave across the western United States" as one of the main causes for the event.[26] While causal attribution for polar vortex events is more complex, the North Carolina Climate Science Report found that polar vortex patterns contributed to cold-weather days in the Carolinas, and that cold winter episodes may be linked to a warming Arctic region.[27] Integrating climate-related physical phenomena and the risks they pose to the electricity grid will better prepare the Companies and South Carolina ratepayers for these events.

Q. Did the Companies incorporate climate-related physical phenomena into their planning?

[25] Roberts Rebuttal, p. 36, ll. 4-21.
[26] California Independent System Operator, California Public Utilities Commission, and California Energy Commission (2021, January). Root Cause Analysis: Mid-August 2020 Extreme Heat Wave. Retrieved at: http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf.
[27] Kunkel, K.E., D.R. Easterling, A. Ballinger, S. Bililign, S.M. Champion, D.R. Corbett, K.D. Dello, J. Dissen, G.M. Lackmann, R.A. Luettich, Jr., L.B. Perry, W.A. Robinson, L.E. Stevens, B.C. Stewart, and A.J. Terando, (2020). North Carolina Climate Science Report. North Carolina Institute for Climate Studies. Retrieved at: https://ncics.org/nccsr.

A. No. I discuss the Companies' failure to adequately assess climate-related physical risks to their system in my direct testimony.[28]

C. Response to Witness Santoianni

Q. Have you reviewed the rebuttal testimony of Companies Witness Dawn Santoianni?

A. I have.

Q. Please describe the issues that Witness Santoianni finds with your testimony.

A. Witness Santoianni raises several technical complaints with the analysis conducted in the Carbon Stranding report, which I have addressed in a previous section. Witness Santoianni's testimony seeks to defend the Companies' and Duke Energy's treatment of climate-related risks in the context of resource planning.

Q. Are there any specific factual issues in Witness Santoianni's rebuttal testimony that you would like to clarify?

A. Yes. Witness Santoianni mentions that the "regulatory purpose" of integrated resource planning is to provide a long-range resource plan for 15 years,[29] and provides support for her statement by mentioning that the 15-year timeframe is specifically identified in the South Carolina IRP statute.[30] As I point out in my direct testimony, Act 62 defines an integrated resource plan as extending for ***at least*** a fifteen-year period.[31] I am not a lawyer, but my interpretation of the plain language of Act 62 leads me to conclude that the "regulatory purpose" for

[28] Fitch Direct, p. 44, l. 13 to p. 45, l. 2.
[29] Santoianni Rebuttal, p. 7, ll. 11-13.
[30] Santoianni Rebuttal, p. 8, l. 4.
[31] Fitch Direct, p. 32, ll. 10-13.

integrated resource plans does not specify a fifteen-year time horizon, but instead identifies fifteen years as the minimum for long-range planning.

Q. Witness Santoianni states that the purpose of integrated resource plans is to maintain system reliability for 15 years.[32] Is that correct?

A. Witness Santoianni's definition is much narrower than the scope of integrated resource planning, as described in Act 62. Act 62 defines the goal of integrated resource planning as providing the *most reasonable and prudent* means of meeting the utility's needs.[33] Act 62 also provides a number of minimum factors for what the Commission should consider when evaluating a given integrated resource plan:

a. resource adequacy and capacity to serve anticipated peak electrical load, and applicable planning reserve margins;
b. consumer affordability and least cost;
c. compliance with applicable state and federal environmental regulations;
d. power supply reliability;
e. commodity price risks;
f. diversity of generation supply; and
g. other foreseeable conditions that the Commission determines to be for the public interest.[34]

While ensuring resource adequacy and reliability is necessary for integrated resource plan, accounting for these factors alone is not sufficient for demonstrating that the plan is most reasonable and prudent. In determining whether the Companies' Plans are most reasonable and prudent for South Carolina ratepayers, the Commission can and should consider the impact of climate-related risks as described in my direct testimony.

[32] Santoianni Rebuttal, p.
[33] Fitch Direct, p. 29, ll. 6-10.
[34] Fitch Direct, p. 29, ll. 11-19.

Q. Witness Santoianni claims that your testimony advocates that the Companies or Commission "set and codify climate policy."[35] Please respond to Witness Santoianni's complaint.

A. My direct testimony shows that climate-related risks are material to the Companies' bottom lines (and their ratepayers' bills), and therefore the Companies should be *responsive* to those risks in line with prudent business management. This directive is more consistent with the Companies' other reasonable business risk management strategies than environmental policymaking. Duke Energy's net-zero by 2050 commitment, for example, represents a responsive action taken by the Companies that acknowledges broad economic forces that will drive de-carbonization through mid-century. The recommendations in my testimony demonstrate the need to conduct actions responsive to climate-related risk at the operating company level. By integrating climate risks into resource planning, neither the Companies nor the Commission would be setting climate policy. Instead, they would be prudently responding to material, relevant, and foreseeable business risks.

Q. Company Witness Santoianni contends that integrated resource planning should not integrate long-term risks and cost drivers.[36] Is that appropriate?

A. No. Integrated resource planning as a regulatory institution emerged at a time when long-term drivers of cost were changing the utility landscape. Integrated resource planning emerged as a way to transparently integrate long-term risk factors.[37]

[35] Santoianni Rebuttal, p. 8, ll. 20-22.
[36] Santoianni Rebuttal, p. 3, ll. 4-7.
[37] *See*: Hirst, E. (1992). A Good Integrated Resource Plan: Guidelines for Electric Utilities and Regulators. *Oak Ridge National Laboratory*. Retrieved at: https://www.osti.gov/servlets/purl/6719825 *and*

Although I am not a lawyer, I understand South Carolina statute's direction to the Commission to determine a "most prudent and reasonable plan" that integrates consideration of several factors including "foreseeable conditions that the Commission determines to be in the public interest" as reflective of integrating long-term risks into integrated resource planning.[38]

Witness Santoianni's description of Duke Energy's corporate treatment of climate-related risks demonstrates the materiality of such risks to the Companies' bottom line. Given the relevance of the Companies' Plans to their own exposure to climate-related risks, it reasonably follows that their integrated resource plans should incorporate long-term climate-related risks.

Q. Witness Santoianni contends that the Companies' Plans appropriately incorporate climate-related risks through scenario planning and their reference carbon price.[39] Please respond to Witness Santoianni's complaint.

A. At issue is not only whether the Companies' individual scenarios fail to appropriately respond to climate-related risks, but also whether the Plan development *process* that created each of the scenarios fails to integrate those risks. Developing a new scenario with different manually-selected resources within the Companies' current scenario development process, for example, would not be sufficient to adequately assess and manage climate-related risks. Instead, the Plan development process must integrate climate-related risks throughout. The

Kahrl, F., Mills, A., Lavin, L., Ryan, N., & Olsen, A. (2016, September). The Future of Electricity Resource Planning. Lawrence Berkeley National Laboratory. Retrieved at: https://www.osti.gov/servlets/purl/1339559.

[38] South Carolina Code of Laws, § 58-37-40(C).

[39] Santoianni Rebuttal, p. 9, l. 16 to p. 10, l. 12.

conclusions and recommendations within my testimony seek to improve the process, rather than change any single scenario.

On the topic of appropriate carbon prices, my direct testimony and Witness Santoianni's rebuttal testimony simply point to different reference points. My direct testimony identifies the US Energy Information Administration's 2020 Annual Energy Outlook and several pieces of proposed federal legislation, identified as reference policies by the Companies in their Plans,[40] as appropriate points of comparison. These remain appropriate references for development of a "shadow" carbon price.

Q. Company Witness Santoianni discusses several activities conducted by the Companies or Duke Energy that are responsive to climate-related risks outside of the integrated resource planning process.[41] How do these relate to the current proceeding?

A. Witness Santoianni references physical mitigation efforts by the Companies and Duke Energy's 2020 Climate Report as examples of ways that the Companies are integrating climate-related risks. While neither effort represents a specific and comprehensive assessment of climate-related risks, these efforts do provide insight on how the Companies could better manage climate-related risks.

Witness Santoianni's description of climate-related physical risks to the Companies' generation assets[42] underscores the relevance of climate-related risks and phenomena to integrated resources planning. Just as Witnesses Snider and

[40] DEP IRP Main Document, pp. 152-153.
[41] Santoianni Rebuttal, p. 11, l. 12 to p. 12, l. 2.
[42] Santoianni Rebuttal p. 11, l. 19 to p. 12, l. 1.

Roberts mention outages caused by impacts to demand and supply of energy due to extreme weather in Texas and California,[43] Witness Santoianni's discussion acknowledges that climate-related phenomena can and will have long-term impacts on both the demand and the supply sides of resource planning. To ensure that the Companies' resource plans are most reasonable and prudent in the face of relevant and foreseeable future conditions, the Plans should incorporate these impacts and their attendant risks explicitly into load forecasting and capacity planning. Notwithstanding Witness Santoianni's discussion, these measures "did not characterize future flood risks,"[44] and therefore will face climate-related physical exposure as flooding conditions continue to change. A comprehensive climate-related physical risk assessment, which I recommend in my testimony, would present the Companies the opportunity to assess risks before they result in negative outcomes, rather than engaging in retrospective mitigation.

Witness Santoianni's discussion of Duke Energy's 2020 Climate Report gets at an emerging issue at the core of utility climate risk and regulatory oversight. Witness Santoianni's discussion of the Duke Energy's 2020 Climate Report seeks to split climate-related risk management off from the integrated resource planning process, without providing transparency in terms of how Duke Energy's corporate climate commitments and risk management strategies inform the development of the Companies' Plans. This provides an obstacle to the regulators' authority to provide appropriate oversight to the Companies' risk management strategies. As an

[43] *See:* Roberts Rebuttal, p. 36, ll. 6-21; *and* Snider Rebuttal, p. 8, ll. 10-13.
[44] Duke Energy Carolinas, LLC and Duke Energy Progress, LLC Response to Vote Solar Data Request 4-4(d).

analogy, the Companies appropriately provide their strategy for managing fuel price risks to the Commission for their review, and Commissioners appropriately provide oversight to ensure that the strategy is prudent and reasonable. The same transparency does not currently exist for the Companies' climate-related risk management strategy.

Q. Witness Santoianni claims that the recommendations provided in your testimony overlap with a settlement reached between Vote Solar and the Companies before the North Carolina Utilities Commission.[45] Please respond to Witness Santoianni's complaint.

A. While climate-related risk management was a central aspect of the settlement before the North Carolina Utilities Commission ("NCUC"), recommendations provided within this proceeding provide an essential complement to the settlement's contents. The settlement agreement identifies the scope of models and analyses within the Climate Risk & Resilience Working Group as follows:

> The models and analyses will, at a minimum, assess the vulnerability of the Companies' distribution and transmission assets and operations to current and projected physical impacts of climate change by utilizing best-practices climate modeling and scenario analysis, utilizing the scenarios identified in the North Carolina Climate Science Report.[46]

The settlement agreement notably does not include the "generation" segment of the Companies' assets and operations because this segment was presumably outside of the scope of the rate case or the Grid Improvement Plan discussed in that

[45] Santoianni Rebuttal, p. 12, l. 18 to p. 13, l. 7.
[46] Duke Energy Carolinas (2020, July). Agreement and Stipulation of Settlement with Vote Solar ("NCUC Settlement"). North Carolina Utilities Commission Docket No. E-7, Sub 1214. Retrieved at: https://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=079d3ea0-dd14-4258-85bd-8e512e69ebfc.

proceeding. The generation segment of the Companies' assets and operations is also subject to climate-related risks, as discussed at length in my direct testimony in this proceeding, and is clearly within the scope of integrated resource planning. A comprehensive climate-related physical risk assessment conducted in the context of integrated resources planning would provide similar coverage for the generation segment. In this way, the recommendations in my direct testimony perform a complementary function with the aforementioned settlement agreement.

The settlement is clear in its scope and explicitly does not preclude further consideration of climate-related risk to the Companies' assets and operations.[47] Given the importance of resource planning decisions made in the context of this proceeding to the Companies' climate-related risk exposure, consideration of climate-related risk is a necessary component of determining whether the Companies' Plans are reasonable and prudent.

Q. Witness Santoianni refers to several power sector modeling analyses in her testimony.[48] How should the Commission approach analyses in this proceeding?

A. The transition to a zero-carbon economy and energy system by mid-century represents a transformational shift in the way that the US energy system operates, and it is rightfully a topic of great interest to experts and academics across the country. The inputs, assumptions, mechanisms, and outputs of these models can provide lessons for how the zero-carbon transition in the Companies' service

[47] *Ibid.*, pp. 5-6.
[48] Santoianni Rebuttal, p. 17, l. 13 to p. 18, l. 10.

territory might unfold, and they can form helpful comparisons and contrasts to the Companies' Plans. To the extent that the Commission finds such studies helpful, it would be appropriate to compare the Companies' Plans to these energy transition studies, while noting assumptions, constraints, and differences in inputs where appropriate.

Witness Santoianni's testimony isolates a single detail of the outputs of these studies—whether the models retain firm generation through 2050—as a justification of the Companies' Plans. This is not an appropriate application of the results of these studies. Instead, any interpretation of model results should look at the results *in their entirety*. If, for example, a study retains a role for gas-fired generation by reducing those units' emissions substantially through a dramatic expansion of renewable energy and transmission in the next decade, then stating that the model maintains a role for misleading is unclear at best and misleading at worst. Witness Santoianni's treatment of these models does not apply the context of the full results of the studies, and her conclusions should be treated with caution.

Q. Witness Santoianni discusses the relevant forum for examining increased regional coordination and the implications of Act 187 in her rebuttal testimony.[49] Please provide your response.

A. The recommendation in my testimony to study the economic benefits of regional coordination is directly relevant to the decision in front of the Commission in this proceeding: Determining whether the Plans filed by the Companies represent the most reasonable and prudent means of meeting the utility's needs. If regional

[49] Santoianni Rebuttal, p. 22, l. 6 to p. 24, l. 4.

coordination would result in benefits for South Carolina ratepayers, as I discuss in my direct testimony, a reasonable and prudent approach might entail pursuing a change in regional coordination, or at least understanding the procedural steps necessary to effect such a change.[50] The Companies appear to acknowledge this conclusion by including as an action item "[c]ontinue to examine the benefits of joint capacity planning and pursue appropriate regulatory actions" in their short-term action plan within the Plans.[51] The recommendations laid out in my testimony provide some additional structure for pursuing clarity on the benefits of regional coordination.

Witness Santoianni's discussion of Act 187 appears to conclude that the existence of the Act prevents the Commission from directing a study of regional coordination.[52] I see no such statement in the text of the Act. However, there may be efficiency benefits to linking these two efforts. Witness Santoianni does not appear to object to the recommendation that the Companies prepare an action plan that lays out regulatory and administrative requirements for pursuing joint capacity planning across service territories, and I continue to recommend that the Commission direct the Companies to do so. If the Commission wishes, it could direct the Companies to integrate the results of the Act 187 study into its 2022 Integrated Resource Plans and include any regional coordination alternatives considered in the Act 187 study into the sensitivity cases for the 2022 Plans.

Q. Are there any points on which you agree with Witness Santoianni?

[50] Fitch Direct, p. 59, l. 1 to p. 60, l. 6.
[51] DEP IRP Main Document, p. 123.
[52] Santoianni Rebuttal, p. 22, l. 21 to p. 23, l. 2.

A. I agree, in part, with Witness Santoianni's discussion of prospective federal climate policy.[53] The timing, ambition, or specific mechanism of future climate policy is not yet known. However, as I point out in my direct testimony, consensus is emerging among economic and financial institutions, including Duke Energy, on a transition to a zero-carbon economy by 2050.[54] While the specific shape that federal policy will take is not yet clear, this should not prevent the Companies or the Commission from considering the implications of the clean energy transition for the Companies and South Carolina ratepayers.

D. Response to Witness Snider

Q. Have you reviewed the rebuttal testimony of Companies Witness Glen Snider?

A. I have.

Q. Please describe the issues that Witness Snider finds with your testimony.

A. Witness Snider raises several technical complaints with the analysis conducted in the Carbon Stranding report, which I have addressed in a previous section. Witness Snider also raises several other complaints with the contents of my direct testimony.

Q. Please describe Mr. Snider's complaint with your testimony regarding its scope.

A. Witness Snider advocates for a 'holistic' view of the Companies' Plans and characterizes the contents of my direct testimony as focusing exclusively on a single topic. Witness Snider provides a diagram to characterize the focus of my testimony, provided below as Figure D-1.

[53] Santoianni Rebuttal, p. 10, l. 15 to p. 11, l. 9.
[54] Fitch Direct, pp. 12-16.

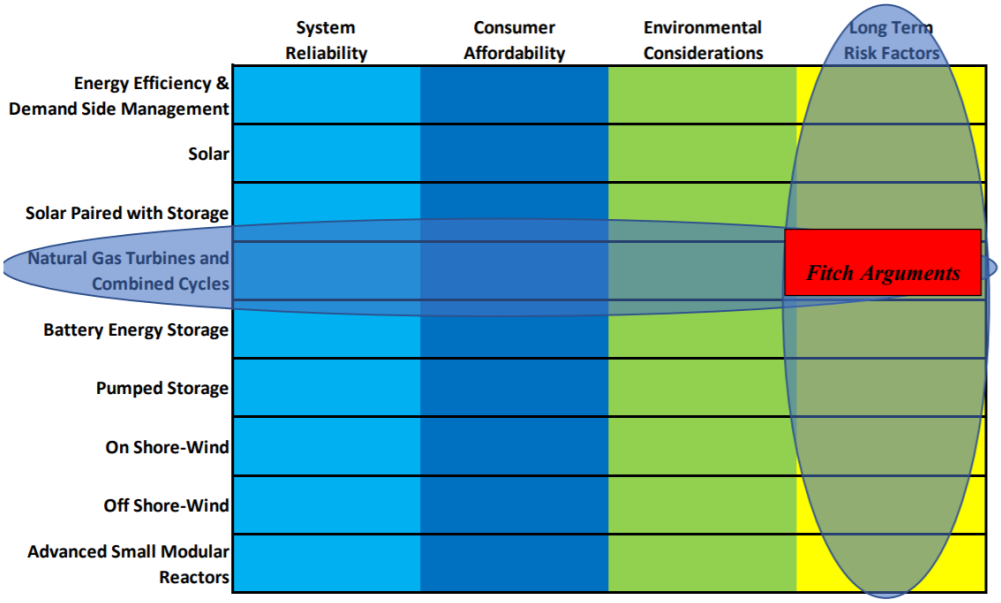

Figure D-1. Witness Snider's Diagram[55]

Q. Please respond to Mr. Snider's complaint.

A. My testimony concerns climate-related risks that will have systematic impacts across the Companies' assets and operations. Witness Snider's table provides a helpful visualization for understanding climate-related risks on the Companies' Plans because climate-related risks impact most, if not all, of the cells in the table. Climate-related phenomena will continue to impact system reliability, customer affordability, and long term risk factors across resource types, and a just and reasonable resource plan should integrate consideration of those impacts. Climate-related impacts to the Companies' ability to achieve physical reliability and customer affordability are discussed in Section II of my direct testimony.

Witness Snider's diagram appropriately emphasizes long-term risk factors to gas generation assets because they are uniquely exposed to climate-related transition

[55] Snider Rebuttal, p. 112.

risks. The Companies' Plans, for example, discuss several retrofits with attendant costs that would need to be completed to reconcile gas investments with Duke Energy's carbon commitments.[56] A prudent and reasonable resource plan should appropriately consider all risks and benefits of resource options available to the Companies, and it is important that a holistic approach accurately characterize the risks of each resource that it considers. My direct testimony demonstrates that the Companies failed to adequately assess or manage those risks for future investment in gas-fired assets. Therefore, the Companies' approach, however holistic, fails to incorporate foreseeable risks.

Q. Witness Snider describes the 2020 IRPs as a "utility view" of the power system for calculating discount rates.[57] Is that appropriate?

A. No. As I detail in my direct testimony, different entities have different time rates of preference.[58] Using a utility's cost-of-capital discount as the discount rate would provide a view of power sector costs and benefits that focus on short-term cost avoidance more appropriate for choosing how to invest capital, rather than long-term savings that are more relevant to ratepayers paying for essential services. Use of a higher discount rate could lead the Companies to decline to invest in resources in the short-term that provide long-term benefits to customers. Especially in the context of integrating long-term climate-related risks into resource planning, it is important that costs calculated in the Companies' Plans maintain a long-term view.

[56] DEP IRP Main Document, pp. 140-142.
[57] Snider Rebuttal, p. 110, ll. 8-12.
[58] Fitch Direct, p. 88, ll. 8-16.

Q. Witness Snider finds issue with your recommendation that the Commission direct Companies to open access to modeling software. Please provide your response.

A. First, I'd like to underscore the potential for collaboration and problem-solving created by shared access to modeling software and inputs across the Companies, ORS, and stakeholders. Opening access to planning software through project-based licenses could create a foundation of shared understanding between stakeholders on the inputs, mechanisms, and outputs of resource planning software. This approach would avoid the work of translation across modeling software used by stakeholders that creates unnecessary difficulty for the Commission in assessing different analytical approaches and ultimately determining the reasonableness and prudence of the Companies' Plans. Although Witness Snider discusses software licenses in the context of a litigated proceeding, a modeling license "seat" could be provided to stakeholders as a part of the Companies' ongoing stakeholder engagement processes. This is a logical extension of the Companies' stakeholder engagement to date, including their Portfolio Screening Tool.[59]

Second, the Encompass software suite selected by the Companies is uniquely suited to this arrangement. Public Service Company of New Mexico ("PNM")'s 2020 IRP, which used Encompass, provides a helpful example. Throughout the development of the IRP, PNM provided stakeholders access to the inputs of the model and allowed stakeholders to determine the parameters for alternative

[59] Snider Rebuttal, p. 30.

scenarios to be modeled in Encompass.[60] Through its license, PNM also procured a server-based installation of Encompass that allowed for intervenor licenses at affordable prices that could be run on PNM's server,[61] resolving the hardware issues identified by Witness Snider.[62] With Commission direction, the Companies could pursue a similar pathway, building valuable shared understanding between stakeholders at an affordable cost.

E. Response to Witness Oliver

Q. Have you reviewed the rebuttal testimony of Companies Witness Oliver?

A. I have.

Q. Please provide a brief summary of Witness Oliver's testimony.

A. Witness Oliver's testimony responds to recommendations made in my direct testimony regarding the integration of the Companies' Integrated Systems & Operations Planning (ISOP) into its integrated resource planning process. His testimony claims that the Companies are already engaged in best practices, and further oversight from the Commission is not needed.

Q. Please provide your response.

A. Generally speaking, integrated distribution planning shares many characteristics with integrated resource planning. The process provides a transparent and predictable forum to ensure that grid investments are being made in the interest of

[60] Public Service Company of New Mexico (2019). PNM 2020-2040 Integrated Resource Plan. p. 14. Retrieved at: https://www.pnmforwardtogether.com/assets/uploads/PNM-2020-IRP-FULL-PLAN-NEW-COVER.pdf.
[61] DTE Electric (2020, June). DTE Electric's Integrated Resource Plan Modeling Software Collaborative Summary Report. Michigan Public Service Commission Case U-20471. p. 10. Retrieved at: https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t000000CIEbLAAX.
[62] Snider Rebuttal, p. 161, l. 15 to p. 162, l. 4.

the long-term benefit of ratepayers and the service of sustainable, reliable, and affordable energy. And, like in integrated resource planning, regulators have a role to play in ensuring that processes and investments continue to serve the public interest. Especially as integrated distribution planning processes promise to change how the grid operates and how distributed energy resources will participate, regulators have a key role to play in ensuring an even playing field and that processes develop in the public interest.

The National Association of Regulatory Utility Commissioners (NARUC) and National Association of State Energy Officials (NASEO), has convened a Task Force on Comprehensive Electricity Planning to provide guidance and structure around best practices for regulator involvement in integrated distribution planning. The Task Force released a Blueprint for State Action on Comprehensive Electricity Planning in February 2021.[63] The blueprint lays out the role that energy offices and regulatory commissioners can play in ensuring an open and transparent process, where all stakeholders have access to information and the opportunity to contribute to the development of these plans.[64] In short, the NARUC-NASEO Blueprint empowers regulators to convene stakeholders and develop a common vision for comprehensive electricity planning across the state. While the Companies' development of ISOP promises to provide new analytical capabilities for the Companies' grid, it may not reflect the perspectives of the Companies' neighboring

[63] NARUC-NASEO Task Force on Comprehensive Electricity System Planning (2021). Blueprint for State Action. Retrieved at: https://pubs.naruc.org/pub/14F19AC8-155D-0A36-311F-4002BC140969.
[64] Ayers, C. Presentation on NARUC-NASEO Task Force to North Carolina Utilities Commission. Docket No. E-100, Sub 165. https://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=2a1285ff-f2c3-4309-a703-1f70d4da2218.

utilities in South Carolina or other stakeholders for whom the evolution of the distribution grid is an important issue. To the extent the Commission identifies such a need for an open, transparent process in South Carolina, it could shift from a role of receiving briefings from the Companies to an active, convening role.

Q. Does this conclude your testimony?

A. Yes.